

1. (Amended) A composition which comprises

- (1) a matrix material; and
- (2) **[distributed in the matrix material, or adjacent to the matrix material,]** a modifying agent which
 - (a) comprises
 - (i) a polymeric moiety **[ingredient]** which comprises a crystalline polymeric moiety having an onset of melting temperature T_O and a peak melting temperature T_P such that $T_P - T_O$ is less than $T_P^{0.7}$; and
 - (ii) **[an active chemical ingredient]** a catalytic moiety which, when in contact with **[a]** the matrix material at an elevated temperature, catalyzes **[promotes or inhibits]** a chemical reaction of the matrix material, and
 - (b) is in the form of **[a solid which, when exposed to a change in a variable selected from temperature, concentration of a solvent, electromagnetic radiation, ultrasonic radiation, and pH, undergoes a physical change which causes the modifying agent to lose its physical integrity and increases the extent to which the matrix material is contacted by the active chemical moiety, said solid form being selected from**
 - (i) solid particles which
 - (i) have some of the active chemical moieties on the surface of the particles and the other active chemical moieties hidden within the particles,
 - (ii) are distributed in the matrix material,

(iii) have [and which have one or more of the following characteristics (a)] an average particle size of [0.1 to] less than 150 micron, and
 (iv) when heated above T_p , undergo a physical change which (A) substantially increases the extent to which the matrix material is contacted by the catalytic moiety and (B) causes the chemical reaction of the matrix material to take place.

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- [(b) a polymeric ingredient having a heat of fusion of at least 20 J/g, and
 (c) a polymeric ingredient in which the crystalline polymeric moiety is a side chain crystalline polymer, and
 (ii) a film which is in contact with the matrix material.]

Cancel claims 2-9

Add the following new claims 10-109

10. A composition according to Claim 1 which also contains a coadditive which contains

- (i) one or more non-polar groups which are alkyl, fluoroalkyl or alkyl styrene groups in which the alkyl groups contain at least 6 carbon atoms, and
 (ii) one or more polar groups which are epoxy, hydroxyl, carboxyl, amino, ammonium, ether, ester, amide, sulfonamide, sulfonic acid, sulfonic acid salt or phosphate groups.

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11. A composition according to Claim 1 wherein the modifying agent contains polar groups and the matrix material contains polar groups.

12. A composition according to Claim 1 wherein

- (a) the matrix material comprises precursors for a thermoset polymer; and
- (b) the catalytic moiety is a catalyst for reaction of said precursors to form the thermoset polymer.

13. A composition according to Claim 12 wherein the crystalline polymer in the polymeric moiety comprises a side chain crystalline polymer.

14. A composition according to Claim 1 wherein

- (a) the matrix material comprises an unsaturated polyester which will undergo a crosslinking reaction when exposed to a metal-containing catalyst; and
- (b) the catalytic moiety is a metal-containing compound which is a catalyst for said crosslinking reaction.

15. A composition according to Claim 14 wherein the crystalline polymer in the polymeric moiety comprises a side chain crystalline polymer.

16. A composition according to Claim 1 wherein

- (a) the matrix material comprises a vinyl ester which will undergo a crosslinking reaction when exposed to a metal-containing catalyst; and
- (b) the catalytic moiety is a metal-containing compound which is a catalyst for said crosslinking reaction.

17. A composition according to Claim 16 wherein the crystalline polymer in the polymeric moiety comprises a side chain crystalline polymer.

18. A composition according to Claim 1 wherein

- (a) the matrix material comprises chemical compounds which will undergo reaction together when exposed to a metal-containing catalyst to form a polyurethane; and
- (b) the catalytic moiety is a metal-containing compound which is a catalyst for said reaction.

19. A composition according to Claim 18 wherein the crystalline polymer in the polymeric moiety comprises a side chain crystalline polymer.
20. A composition according to Claim 1 wherein
- (a) the matrix material comprises chemical compounds which will undergo reaction together when exposed to a metal-containing catalyst to form a polyurea; and
 - (b) the catalytic moiety is a metal-containing compound which is a catalyst for said reaction.
21. A composition according to Claim 20 wherein the crystalline polymer in the polymeric moiety comprises a side chain crystalline polymer.
22. A composition according to Claim 1 wherein
- (a) the matrix material comprises chemical compounds which will undergo reaction together when exposed to a metal-containing catalyst to form a polyisocyanurate; and
 - (b) the catalytic moiety is a metal-containing compound which is a catalyst for said reaction.
23. A composition according to Claim 22 wherein the crystalline polymer in the polymeric moiety comprises a side chain crystalline polymer.
24. A composition according to Claim 1 wherein
- (a) the matrix material comprises epoxy resin precursors which will undergo reaction together when exposed to a catalyst to form an epoxy resin; and
 - (b) the catalytic moiety is a catalyst for said reaction.
25. A composition according to Claim 24 wherein the crystalline polymer in the polymeric moiety comprises a side chain crystalline polymer.

26. A composition according to Claim 1 wherein
- (a) the matrix material will undergo chemical reaction when exposed to an azo initiator; and
 - (b) the catalytic moiety contains an azo group.
27. A composition according to Claim 26 wherein the crystalline polymer in the polymeric moiety comprises a side chain crystalline polymer.
28. A composition according to Claim 1 wherein
- (a) the matrix material will undergo chemical reaction when exposed to a peroxy initiator; and
 - (b) the catalytic moiety i contains a peroxy group.
29. A composition according to Claim 28 wherein the crystalline polymer in the polymeric moiety comprises a side chain crystalline polymer.
30. A composition which comprises
- (1) a matrix material; and
 - (2) a modifying agent which
 - (a) comprises
 - (i) a polymeric moiety which comprises a crystalline polymeric moiety having an onset of melting temperature T_O and a peak melting temperature T_P such that $T_P - T_O$ is less than $T_P^{0.7}$; and
 - (ii) a catalytic moiety which is bonded to the polymeric moiety through a bond having a strength of at least 10 Kcal/mole, and which, when in contact with the matrix material at an elevated temperature, catalyzes a chemical reaction of the matrix material, and
 - (b) is in the form of solid particles which

- (i) are distributed in the matrix material,
- (ii) have an average particle size of less than 150 micron, and
- (iii) when heated above T_p , undergo a physical change which
 - (A) substantially increases the extent to which the matrix material is contacted by the catalytic moiety and
 - (B) causes the chemical reaction of the matrix material to take place.

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31. A composition according to claim 30 wherein the modifying agent is in the form of particles having an average particle size of 0.1 to 50 micron.

32. A composition according to claim 30 wherein the polymeric moiety comprises a side chain crystalline polymeric moiety.

33. A composition according to claim 32 wherein the side chain crystalline polymeric moiety comprises units derived from one or more monomers comprising an n-alkyl group containing 12 to 50 carbon atoms.

34. A composition according to claim 54 wherein said units are derived from an n-alkyl acrylate, n-alkyl methacrylate, n-alkyl acrylamide or n-alkyl methacrylamide.

35. A composition according to claim 32 wherein the modifying agent is present in the form of solid particles which have an average diameter of 0.1 to 25 microns.

36. A composition according to claim 32 wherein the side chain crystalline polymeric moiety has a crystalline melting point of 50 to 100°C.

37. A composition according to claim 32 wherein the modifying agent has a number average molecular weight of 1,000 to 50,000.

38. A composition according to claim 30 wherein the solid particles have some of the active chemical moieties on the surface of the particles and the other active chemical moieties hidden within the particles.

39. A composition according to claim 30 wherein the matrix material is liquid, and which (i) can be stored at 40 °C. for 6 months without doubling in viscosity and (ii), when heated to a temperature substantially over T_p , will cure in less than 1 hour to a composition which will not flow.

40. A composition according to claim 30 wherein $T_p - T_0$ is less than 10 °C.

41. A composition according to claim 30 wherein the catalytic moiety comprises a metal.

42. A composition according to claim 41 wherein the catalytic moiety comprises tin.

43. A composition according to claim 41 wherein the catalytic moiety comprises a transition metal.

44. A composition according to claim 41 wherein the catalytic moiety comprises a main group metal selected from aluminum, tin and lead.

45. A composition according to claim 30 wherein the catalytic moiety comprises an amine group.

46. A composition according to claim 30 wherein the catalytic moiety comprises an enzyme.

47. A composition according to claim 30 wherein the catalytic moiety comprises a carboxyl or sulfonate group.

48. A composition according to claim 30, wherein the crystalline polymeric moiety has a heat of fusion, as measured by a differential scanning calorimeter (DSC), of at least 20 J/g.
49. A composition according to claim 30, wherein the particles of the modifying agent have an average particle size of 0.1 to 150 microns.
50. A composition according to claim 41, wherein the crystalline polymeric moiety has a heat of fusion, as measured by a differential scanning calorimeter (DSC), of at least 20 J/g.
51. A composition according to claim 30, wherein the matrix material provides a continuous liquid phase.
73. A composition according to claim 30, wherein the matrix material provides a continuous solid phase.
53. A composition according to claim 30, wherein the matrix material is in the form of particles which are blended with the particles of modifying agent.
54. A composition which comprises
- (1) a matrix material which comprises precursors for a crosslinked thermoset epoxy resin; and
 - (2) a modifying agent which
 - (a) comprises
 - (i) a polymeric moiety which has a heat of fusion, as measured by a differential scanning calorimeter (DSC), of at least 20 J/g and which comprises a side chain crystalline polymeric moiety having an onset of melting temperature T_O and a peak melting temperature T_P such that $T_P - T_O$ is less than $T_P^{0.7}$ and less than 10 °C.; and

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- (ii) a catalytic moiety which is bonded to the polymeric moiety through a bond having a strength of at least 10 Kcal/mole, and which, when in contact with the matrix material at an elevated temperature, catalyzes chemical reaction of the matrix material to form the thermoset epoxy resin, and
 - (b) is in the form of solid particles which
 - (i) are distributed in the matrix material,
 - (ii) have an average particle size of less than 150 microns, and
 - (iii) when heated above T_p , undergo a physical change which
 - (A) substantially increases the extent to which the matrix material is contacted by the catalytic moiety and
 - (B) causes the chemical reaction of the matrix material to form the thermoset epoxy resin.

55. A composition according to claim 54 wherein the modifying agent is in the form of particles having an average particle size of 0.1 to 50 microns.

56. A composition according to claim 54 wherein the side chain crystalline polymeric moiety comprises units derived from one or more monomers comprising an n-alkyl group containing 12 to 50 carbon atoms.

57. A composition according to claim 54 wherein said units are derived from an n-alkyl acrylate, n-alkyl methacrylate, n-alkyl acrylamide or n-alkyl methacrylamide.

58. A composition according to claim 54 wherein the polymeric moiety comprises a thermoplastic elastomer.

59. A composition according to claim 54 wherein the modifying agent is present in the form of solid particles which have an average diameter of 0.1 to 25 microns.

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70. A composition according to claim 54, wherein the matrix material provides a continuous liquid phase.

92. A composition according to claim 54, wherein the matrix material provides a continuous solid phase.

72. A composition according to claim 54, wherein the matrix material is in the form of particles which are blended with the particles of modifying agent.

73. A composition which comprises

- (1) a matrix material which comprises precursors for a crosslinked thermoset polyurethane resin; and
- (2) a modifying agent which
 - (a) comprises
 - (i) a polymeric moiety which has a heat of fusion, as measured by a differential scanning calorimeter (DSC), of at least 20 J/g and which comprises a side chain crystalline polymeric moiety having an onset of melting temperature T_O and a peak melting temperature T_P such that $T_P - T_O$ is less than $T_P^{0.7}$ and less than $10^\circ\text{C}.$; and
 - (ii) a catalytic moiety which is bonded to the polymeric moiety through a bond having a strength of at least 10 Kcal/mole, and which, when in contact with the matrix material at an elevated temperature, catalyzes a chemical reaction of the matrix material to form the thermoset polyurethane resin, and
 - (b) is in the form of solid particles which
 - (i) are distributed in the matrix material,
 - (ii) have an average particle size of less than 150_micron, and
 - (iii) when heated above T_P , undergo a physical change which

- (A) substantially increases the extent to which the matrix material is contacted by the catalytic moiety and
- (Bi) causes the chemical reaction of the matrix material to form the thermoset polyurethane resin.

74. A composition according to claim 73 wherein the modifying agent is in the form of particles having an average particle size of 0.1 to 50 microns.

75. A composition according to claim 73 wherein the side chain crystalline polymeric moiety comprises units derived from one or more monomers comprising an n-alkyl group containing 12 to 50 carbon atoms.

76. A composition according to claim 75 wherein said units are derived from an n-alkyl acrylate, n-alkyl methacrylate, n-alkyl acrylamide or n-alkyl methacrylamide.

77. A composition according to claim 75 wherein the polymeric moiety comprises a thermoplastic elastomer.

78. A composition according to claim 73 wherein the modifying agent is present in the form of solid particles which have an average diameter of 0.1 to 25 microns.

79. A composition according to claim 73 wherein the side chain crystalline polymeric moiety has a crystalline melting point of 50 to 100°C.

80. A composition according to claim 73 wherein the modifying agent has a number average molecular weight of 1,000 to 50,000.

81. A composition according to claim 73 wherein the matrix material is liquid, and which (i) can be stored at 40 °C. for 6 months without doubling in viscosity and (ii), when heated to a temperature substantially over T_p , will cure in less than 1 hour to a composition which will not flow.

82. A composition according to claim 73 wherein $T_p - T_o$ is less than 10°C.
83. A composition according to claim 73 wherein the catalytic moiety comprises a metal or a metal-containing group.
84. A composition according to claim 83 wherein the catalytic moiety comprises tin.
85. A composition according to claim 83 wherein the catalytic moiety comprises a transition metal.
86. A composition according to claim 83 wherein the catalytic moiety comprises a main group metal selected from aluminum, tin and lead.
87. A composition according to claim 73 which forms a foamed thermoset resin when it is heated.
88. A composition according to claim 73, wherein the particles of the modifying agent have an average particle size of 0.1 to 150 microns.
89. A composition according to claim 73, wherein the matrix material provides a continuous liquid phase.
90. A composition according to claim 73, wherein the matrix material provides a continuous solid phase.
91. A composition according to claim 73, wherein the matrix material is in the form of particles which are blended with the particles of modifying agent.

92. A composition which comprises

- (1) a matrix material which comprises precursors for a crosslinked thermoset resin; and
- (2) a modifying agent which
 - (a) comprises
 - (i) a polymeric moiety which has a heat of fusion, as measured by a differential scanning calorimeter (DSC), of at least 20 J/g and which comprises a side chain crystalline polymeric moiety having an onset of melting temperature T_O and a peak melting temperature T_P which is no more than 85 °C and such that $T_P - T_O$ is less than $T_P^{0.7}$; and
 - (ii) a catalytic moiety which contains an amine group, which is bonded to the polymeric moiety through a covalent bond having a strength of at least 10 Kcal/mole, and which, when in contact with the matrix material at an elevated temperature, catalyzes a chemical reaction of the matrix material to form the thermoset resin, and
 - (b) is in the form of solid particles which
 - (i) are distributed in the matrix material,
 - (ii) have an average particle size of 0.1 to 50 micron, and
 - (iii) when heated above T_P , undergo a physical change which
 - (A) substantially increases the extent to which the matrix material is contacted by the catalytic moiety and
 - (B) causes the chemical reaction of the matrix material to form the thermoset resin.

93. A composition according to claim 92, wherein the side chain crystalline polymeric moiety comprises 40 to 100% of units derived from an alkyl acrylate in which the alkyl group contains 12 to 50 carbon atoms, 0 to 20% of units derived from an alkyl acrylate in which the alkyl group contains 4 to 12 carbon atoms, and 0 to 15% of units derived

from at least one polar group selected from group consisting of acrylic acid, methacrylic acid, itaconic acid, acrylamide, methacrylamide, acrylonitrile, methacrylonitrile, vinyl acetate and N-vinyl pyrrolidone.

94. A composition according to claim 92, wherein the side chain crystalline polymeric moiety consists essentially of 40 to 100% of units derived from the alkyl acrylate in which the alkyl group contains 22 carbon atoms and 0 to 15% of units derived from acrylic acid.

95. A composition which comprises

- (1) a matrix material; and
- (2) a modifying agent which
 - (a) comprises
 - (i) a polymeric ingredient which comprises a crystalline polymeric moiety having an onset of melting temperature T_O and a peak melting temperature T_P such that $T_P - T_O$ is less than $T_P^{0.7}$, and
 - (ii) a catalytic ingredient which is physically but not chemically bound to the polymeric ingredient, and which, when in contact with the matrix material at an elevated temperature, catalyzes a chemical reaction of the matrix material, and
 - (b) is in the form of solid particles which
 - (i) have some of the active chemical moieties on the surface of the particles and the other active chemical moieties hidden within the particles
 - (ii) are distributed in the matrix material,
 - (iii) have an average particle size of less than the 150 micron, and
 - (iv) when heated above T_P , undergo a physical change which

- (A) substantially increases the extent to which the matrix material is contacted by the catalytic ingredient, and
- (b) causes the chemical reaction of the matrix material to take place.

96. A composition according to claim 95 which also contains a coadditive which contains (i) one or more non-polar groups which are alkyl, fluoroalkyl, or alkyl styrene groups in which the alkyl groups contain at least 6 carbon atoms, and (ii) one or more polar groups which are epoxy, hydroxyl, carboxyl, amino, ammonium, ether, ester, amide, sulfonamide, sulfonic acid, sulfonic acid salt or phosphate groups.

97. A composition according to claim 95 wherein the modifying agent contains polar groups and the matrix material contains polar groups.

98. A composition according to claim 95 wherein the modifying agent is in the form of solid particles which are dispersed in a continuous solid or liquid phase of the matrix material.

99. A composition according to claim 98 wherein

- (a) the matrix material comprises an unsaturated polyester which will undergo a crosslinking reaction when exposed to a metal-containing catalyst; and
- (c) the catalytic ingredient is a metal-containing compound which is a catalyst for said crosslinking reaction.

100. A composition according to claim 99 wherein the polymeric ingredient is a side chain crystalline polymer, and both the side chain crystalline polymer and the metal-containing compound contain a group selected from polar groups and long chain alkyl groups.

101. A composition according to claim 98 wherein
 - (a) the matrix material comprises a vinyl ester which will undergo a crosslinking reaction when exposed to a metal-containing catalyst; and
 - (b) the catalytic ingredient is a metal-containing compound which is a catalyst for said crosslinking reaction.
102. A composition according to claim 101 wherein the polymeric ingredient is a side chain crystalline polymer
103. A composition according to claim 98 wherein
 - (a) the matrix material comprises chemical compounds which will undergo reaction together to form a polyurethane, and
 - (b) the catalytic ingredient is a metal-containing compound which is a catalyst for said reaction.
104. A composition according to claim 103 wherein the polymeric ingredient is a side chain crystalline polymer
105. A composition according to claim 104 which forms a foamed product when subjected to a reaction injection molding process.
106. A composition according to claim 98 wherein
 - (a) the matrix material comprises chemical compounds which will undergo reaction together to form a polyurea, and
 - (b) the catalytic ingredient is a metal-containing compound which is a catalyst for said reaction.
107. A composition according to claim 106 wherein the polymeric ingredient is a side chain crystalline polymer